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स्वचल वाहन — स्वचल वायु ब्रेक तंत्र के  
वाल्व — परीक्षण पद्धति  
( पहला पुनरीक्षण )

**Automotive Vehicles — Valves of  
Automotive Air Brake Systems —  
Method of Test**  
( *First Revision* )

ICS 43.040.40; 83.140.50

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## FOREWORD

This Indian Standard (First Revision) was adopted by Bureau of Indian Standards, after the draft finalized by the Automotive Braking and Steering Systems, Vehicle Testing and Performance Evaluation Sectional Committee had been approved by the Transport Engineering Division Council.

Braking system components play a vital role in the functioning of a vehicle. This standard specifies the method of test of valves for automotive air brake system.

This standard was first published in 1987. This revision has been taken up to update based on latest technology available in the field. This standard is one in the series of Indian Standards being developed for air brake components. This standard forms an important adjunct to IS 11852 : 2012 'Automotive vehicles — Uniform provisions concerning the approval of vehicles of categories M, N and T with regard to braking (*second revision*)', for the performance requirements of braking systems for automotive vehicles.

The composition of the Committee responsible for the formulation of this standard is given at Annex A.

In reporting the result of a test or analysis made in accordance with this standard, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

*Indian Standard*

# AUTOMOTIVE VEHICLES — VALVES OF AUTOMOTIVE AIR BRAKE SYSTEMS — METHOD OF TEST

( *First Revision* )

## 1 SCOPE

This standard specifies the method of tests for valves used in air brake systems of automotive vehicles.

## 2 REFERENCE

The following standard contains provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

<i>IS No.</i>	<i>Title</i>
9844 : 1981	Methods of testing corrosion resistance of electroplated and anodized aluminum coating by neutral salt spray test

## 3 GENERAL REQUIREMENTS

**3.1 Temperature** — Unless otherwise specified, all tests shall be conducted at ambient conditions.

**3.2 Mounting** — All tests shall be conducted with the unit mounted as in actual usage condition.

**3.3 Leakage Measurement** — All leakage rates shall be expressed in standard cubic centimeters per minute (cc/min).

**3.4 Units of Pressure** — All pressure units shall be expressed in bar as gauge pressure (that is, above atmospheric pressure), unless otherwise specified.

**3.5 Cycle Rate for Endurance Test** — All endurance tests shall be carried out at a rate agreed to between the manufacturer and the purchaser and shall be decided to ensure that no abnormal effects are introduced attributable to the cycle rate.

**3.6 Air Supply** — Unless otherwise specified, the air quality shall be filtered and dry.

**3.7 Test Sequence** — Unless otherwise specified, the same valve need not be used for more than one test.

**3.8 Multiple Function Valves** — Valves with multiple functions shall be tested for applicable test as agreed upon by the valve manufacturer and the purchaser.

**3.9 Delivery Reservoir Volume for Endurance Test** — The reservoir capacity on the delivery side of the valve for all endurance tests shall be as agreed to between the valve manufacturer and the purchaser.

## 4 TEST PROCEDURES

### 4.1 Performance Test

The test and test procedure for the performance of input-output characteristics shall be determined by the intended design and functions as agreed upon by the valve manufacturer and the purchaser. A typical characteristic should be comparison of input pressure, effort, travel or angle versus output pressure (application and release) or as agreed to between the supplier and the purchaser.

### 4.2 Leak Test

**4.2.1 Pilot Operated or Manually Operated Valves**  
Graduating types.

#### 4.2.1.1 Leak test in zero delivery pressure condition

- a) With low supply pressure 100 kPa (1 bar) at the inlet port(s) and delivery open to atmosphere, leakage shall be measured and recorded.
- b) With full supply pressure at the inlet port(s) and delivery open to atmosphere, leakage shall be measured and recorded.

#### 4.2.1.2 Leak test in balanced condition

With full supply pressure at the inlet port, the valve shall be actuated to increasing delivery pressures of 100 kPa (1 bar) and 400 kPa (4 bar). Leakage shall be measured and recorded.

#### 4.2.1.3 Leak test in full delivery condition

With full supply pressure at the inlet port, the valve shall be actuated to attain full delivery pressure within the tolerance specified by the supplier. Leakage shall be measured and recorded.

#### **4.2.2 Pilot Operated or Manually Operated Valves**

Non-graduating type (ON-OFF type).

##### **4.2.2.1 Leak test in zero delivery pressure condition**

- a) With low supply pressure 100 kPa (1 bar) at the inlet port(s) and delivery open to atmosphere, leakage shall be measured and recorded.
- b) With full supply pressure at the inlet port(s) and delivery open to atmosphere, leakage shall be measured and recorded.

##### **4.2.2.2 Leak test in full delivery condition**

With full supply pressure at the inlet port, the valve shall be actuated to attain full delivery pressure. Leakage shall be measured and recorded.

#### **4.2.3 Direction Control Valves**

##### **4.2.3.1 Low pressure leak test**

With 1 bar pressure at the inlet, leakage shall be measured and recorded.

##### **4.2.3.2 Intermediate pressure leak test**

With 4 bar pressure at the inlet, leakage shall be measured and recorded.

##### **4.2.3.3 Full pressure leak test**

With full air pressure at the inlet, leakage shall be measured and recorded.

NOTE — Valves with two independent inlet ports shall be tested with one inlet port pressurized and the second open to atmospheric pressure. These valves shall then be re-tested with the second inlet port pressurized and the first port open to atmospheric pressure.

#### **4.2.4 Automatic Pressure Regulating Valve**

**4.2.4.1** With an air pressure level to the inlet port maintained at 100 kPa (1 bar) descending and ascending prior to automatic actuation point, leakage shall be measured and recorded.

**4.2.4.2** With full air pressure at the inlet port, leakage shall be measured and recorded.

### **4.3 ENDURANCE TEST**

Although the below details are guideline however the specifics and details to be as agreed to between the supplier and the purchaser.

#### **4.3.1 Endurance of Graduating Type of Valves**

With an air pressure equal to full working pressure at the inlet port(s), the valve shall be cycled to partial/full application. The distribution shall be agreed upon by the valve manufacturer and the purchaser.

#### **4.3.2 Endurance of Non-Graduating Type of Valves**

With an air pressure equal to full working pressure at

the inlet port, the valve shall be cycled to full delivery pressure.

#### **4.3.3 Post Endurance Test**

The valve shall be tested as per **4.1** and **4.2**. The allowable deterioration in measured parameters shall be mutually agreed to between the purchaser and the supplier.

### **4.4 LOW TEMPERATURE TEST**

**4.4.1** The valve shall be kept in a chamber maintained at a temperature of -40 °C for 24 h and shall be tested for leakage as per **4.1** and **4.2**.

#### **4.4.2 Low Temperature Functional Test**

As agreed to between the valve manufacturer and the purchaser.

**4.4.3** The valve shall then allowed to return to room temperature and tested in accordance with **4.1** and **4.2**.

### **4.5 HIGH TEMPERATURE TEST**

**4.5.1** The valve shall be kept in a chamber maintained at a temperature of 80°C for 24 h and shall be tested for leakage as per **4.2**.

#### **4.5.2 High Temperature Functional Test**

As agreed to between the valve manufacturer and the purchaser.

**4.5.3** The valve shall then allowed to return to room temperature and tested in accordance with **4.1** and **4.2**.

### **4.6 PRESSURE TEST**

#### **4.6.1 Over Pressure Test**

##### **4.6.1.1 Pilot operated or manually operated valves**

- a) *Zero delivery pressure condition* — An air pressure of maximum system pressure shall be applied and maintained for 10 s at the inlet port with no pressure in delivery.
- b) *Full delivery pressure condition* — An air pressure of maximum system pressure shall be applied and maintained for 10 s at the inlet port with full pressure in delivery and control port (if applicable)
- c) The valve shall then be tested as per **4.1** and **4.2**.

##### **4.6.1.2 Direction control valves and automatic pressure regulating valves**

- a) An air pressure of 1 150 kPa (11.5 bar) bar shall be applied and maintained for 10 s at the inlet port.
- b) The valve shall then be tested as per **4.1** and **4.2**.

NOTE — Valves with two independent inlet ports shall be tested with one inlet port pressurized and the second open to atmospheric pressure. These valves shall then be re-tested with the second.

#### 4.6.2 High Pressure Test

##### 4.6.2.1 Pilot Operated or Manually Operated Valves

- a) *Zero delivery pressure condition* — A hydrostatic pressure of 2 MPa (20 bar) shall be applied and maintained for 60 s at the inlet port with no pressure in delivery. The valve shall then be checked for leakage and permanent damage.
- b) *Full delivery pressure condition* — A hydrostatic pressure of 2 MPa (20 bar) shall be applied and maintained for 60 s at the inlet port with full pressure in delivery and control port (if applicable). The valve shall then be checked for leakage and any permanent damage.

##### 4.6.2.2 Direction control valves and automatic pressure regulating valves

A hydrostatic pressure of 2 MPa (20 bar) shall be applied and maintained for 60 s. The valve shall then be checked for leakage and any permanent damage.

NOTE — Valves with two independent inlet ports shall be tested with one inlet port pressurized and the second open to atmospheric pressure. These valves shall then be re-tested with the second inlet port pressurized and the first port open to atmospheric pressure.

#### 4.7 INSTALLATION LOAD TEST

The procedure for this test shall be determined by the intended design and function as agreed to between the

valve manufacturer and the purchaser, taking into consideration operating and vibration loads.

#### 4.8 DUST TEST

The procedure for this test shall be determined by the intended design and function as agreed to between the valve manufacturer and the purchaser.

#### 4.9 SALT SPRAY TEST

The valve shall be subjected to salt spray test in accordance with IS 9844. Valve shall be visually inspected and extent of any corrosion shall be noted down after each 24 h increment of exposure until the test is completed. The fasteners shall be excluded from the acceptance criteria of level of corrosion. The duration of test shall be at least for 96 h or as agreed to between the purchaser and the supplier. Typical example with respect to application:

- a) On and under chassis components – 240 h; and
- b) On cabin – 96 h.

The acceptable degree of corrosion and performance shall be as agreed to between the supplier and the purchaser.

#### 4.10 VIBRATION TEST

The unit shall be subjected to a vibration acceleration level of  $\pm 7g$  for chassis mounted,  $\pm 3.5g$  for cab mounted at 67 Hz, for 8 h in three mutually perpendicular directions (4 h in main orientation and 2 h each in other two orientations) or as mutually agreed to between the supplier and the purchaser.

At the end of the test, the unit shall not have any structural damage and shall meet performance test as per 4.1.

## ANNEX A

### (Foreword)

#### COMMITTEE COMPOSITION

##### Automotive Braking and Steering Systems, Vehicle Testing and Performance

##### Evaluation Sectional Committee, TED 4

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